

What is Claimed:

- 1 1. Apparatus for monitoring multiple computing devices coupled to a network comprising:
2 a) a management computing device having software for monitoring multiple monitored
3 computing devices that are coupled to a network, said management computing device including an
4 aggregator component that accumulates information regarding the multiple monitored computing
5 devices;
6 b) a video display for displaying a result from the aggregator component;
7 c) a plurality of monitored computing devices coupled to the management computing
8 device by means of the network to enable information regarding the monitored computing devices
9 to be determined by the aggregator component of said management computing device; and
10 d) each of said plurality of monitored computing devices implementing a schema for
11 responding to queries by the aggregator component by providing an access point to information
12 about the monitored computing devices.
- 13 2. The apparatus of claim 1 additionally comprising one or more client computing devices coupled
14 to the management computing device by means of the network and wherein the video display is
15 coupled to one of the client computing devices.
- 16 3. The apparatus of claim 1 wherein the schema includes a class hierarchy of managed elements
17 and wherein an access point instance is created for each monitored computing device to provide a
18 means of monitoring managed elements of a associated monitored computing device.
- 19 4. The apparatus of claim 3 wherein a web element class is defined that is instantiated to include
20 web elements contained within a monitored computing device.
- 21 5. The apparatus of claim 1 wherein each of the monitored computing devices includes a data
22 repository and wherein the schema defines a manner in which data is entered into the data
23 repository when the monitored computing device is added to the network.

1 6. A method for monitoring and configuring multiple computing devices coupled to a network
2 comprising:
3 a) providing a management computing device having software for monitoring multiple
4 other computing devices, said management computing device including an aggregator component
5 that accumulates information regarding the multiple other computing devices;
6 b) connecting a plurality of other computing devices to the management computing device
7 by means of a network to enable information regarding the other computing devices to be
8 determined by the aggregator component of said management computing device;
9 c) accessing the results provided by the aggregator and updating an output for conveying
10 information about the multiple other computing devices based on a result from the aggregator
11 component; and
12 d) maintaining a data repository on each of the other computing devices that is based on a
13 monitoring and control schema for providing information to the aggregator component

7. The method of claim 6 wherein the monitoring and control schema defines a class hierarchy of elements that depend from a base class and include an access point for examining elements for a given one of said other computing devices.

8. The method of claim 7 wherein the monitoring and control schema defines elements that are associated with other elements by means of a containment association.

9. The method of claim 7 wherein the monitoring and control schema defines elements that are related to each other by events transmitted to the aggregator component by a user interface.

10. The method of claim 9 wherein the events are initiated by a client computing device coupled to the management computing device by means of a network connection.

11. The method of claim 6 wherein the aggregator component accesses, in sequence, multiple other computing devices coupled to the network.

12. The method of claim 6 wherein the monitoring and control schema is a class hierarchy of elements that depend from a base class and wherein the aggregator component associates one or more result elements with an event, and for each of said one or more result elements, the aggregator determines if the result element has an aggregate association with other elements.

13. The method of claim 12 wherein the aggregator component traverses multiple layers of elements to determine aggregate associations between elements.

14. The method of claim 13 wherein for each element the aggregator component obtains data from a data property for that element and uses the data format property of said element to format data from the data property.

15. The method of claim 14 wherein the data property is an SQL string which the management component executes for an associated other computing device on the network.

16. A repository data structure for storing data corresponding to a schema for defining relations between objects of a server computing device coupled by means of a network to a management server device, said repository data structure derived from a compilation of a managed object format language rendering of the schema, said rendering including

a) a base class of type management element;

b) a first derived class having elements that depend from the base class of type management element, said first derived class elements having attributes comprising a display format and a display name; and

c) an on event class that defines a source and result relationship between two objects of the type management element.

17. The data structure of claim 16 additionally comprising a aggregate class that defines elements having a parent and child relation between instances of the management element type object.

18. The data structure of claim 16 wherein the first derived class further includes a datatype field and a data field and wherein one type of datatype causes the data in the data field to be interpreted as a SQL statement.

19. A machine readable medium including instructions for monitoring multiple computing devices coupled to a network, said medium including instructions for:

- a) providing an aggregator component on a management computing device that accumulates information regarding a multiple number of other computing devices;
- b) obtaining information regarding the other computing devices for use by the aggregator component of said management computing device;
- c) updating an output for conveying information about the multiple other computing devices based on a result from the aggregator component; and
- d) said obtaining step performed by instructions that access data from a data repository on each of the other computing devices that is based on a monitoring and control schema for providing information to the aggregator component.

20. The machine readable medium of claim 19 wherein the monitoring and control schema defines a class hierarchy of elements that depend from a base class which the aggregator component accesses by means of an access point for examining elements for a given one of said other computing devices.

21. The machine readable medium of claim 20 wherein the monitoring and control schema defines elements that are associated with other elements by means of a containment association.

22. The machine readable medium of claim 20 wherein the monitoring and control schema defines elements that are related to each other by events transmitted to the aggregator component of the management computing device by means of a user interface component of said management computing device.

23. The machine readable medium of claim 19 wherein the aggregator component accesses, in sequence, multiple other computing devices coupled to the network.

24. The machine readable medium of claim 19 wherein the monitoring and control schema is a class hierarchy of elements that depend from a base class and wherein the aggregator component associates one or more result elements with an event, and for each of said one or more result elements, the aggregator determines if the result element has an aggregate association with other elements.

25. The machine readable medium of claim 19 wherein for each element the aggregator component obtains data from a data property for that element and uses the data format property of said element to format data from the data property.

1 26. A process for maintaining a data repository structure for storing data corresponding to a
2 schema for defining relations between objects of a computing device coupled by means of a
3 network to a management computing device, said data repository structure derived from a
4 compilation of a managed object format language rendering of the schema, said rendering
5 including
6 a) defining a base class of type management element;
7 b) deriving a first derived class having elements that depend from the base class of type
8 management element, said first derived class elements having attributes comprising a display
9 format and a display name; and
10 c) defining an on event class that defines a source and result relationship between two
11 objects of the type management element.

27. The method of claim 26 additionally comprising defining an aggregate class that defines elements having a parent and child relation between instances of the management element type object.

1 28. A machine readable medium including instructions for monitoring multiple computing devices
2 coupled to each other by means of a network , said medium including instructions for:

- 3 a) monitoring multiple computing devices by providing an aggregator component on a
4 management computing device that accumulates information regarding multiple other computing
5 devices;
- 6 b) obtaining information regarding the other computing devices for use by the aggregator
7 component of said management computing device;
- 8 c) generating a visual output for conveying information about the multiple other computing
9 devices based on a result from the aggregator component formatted according to data maintained
10 on a data repository on each of the other computing devices that is based on a monitoring and
11 control schema for providing information to the aggregator component; and
- 12 d) monitoring inputs from a user interface to enable the management computer to update
13 data stored in the data repository of one or more of said other computer devices.

29. The machine readable medium of claim 28 wherein each of the other computing devices includes different types of managed elements and wherein instructions implementing the aggregator component obtains data from a data property for a managed element and uses the data format property of said managed element to format data for presentation on the visual output.

30. The machine readable medium of claim 28 wherein the monitoring and control schema defines a class hierarchy of managed elements that depend from a base class and include an access point and wherein the medium includes instructions enabling the aggregator to examine elements within the hierarchy for a given one of said other computing devices.

31. The machine readable medium of claim 30 wherein the monitoring and control schema defines managed elements that are associated with other managed elements by means of a containment association and wherein the instructions that implement the aggregator component examine in a recursive manner managed elements contained within other managed elements.

32. The machine readable medium of claim 28 wherein the monitoring and control schema stored on the other computing devices defines managed elements that are related to each other by an on

event association between managed elements and where an event is initiated at the user interface and evaluated by the aggregator component of said management computing device.

33. The machine readable medium of claim 28 wherein the monitoring and control schema is a class hierarchy of managed elements that depend from a base class and wherein the aggregator component associates one or more result managed elements with an event, and for each of said one or more result managed elements, the aggregator determines if the result managed element has an aggregate association with other managed elements.

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